

Working Paper 88-09
1988 O'HARE INTERNATIONAL AIRPORT
LIMOUSINE DWELL TIME STUDY

Chicago Area Transportation Study
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1988 O'HARE INTERNATIONAL AIRPORT

LIMOUSINE DWELL TIME STUDY

by

Systems Surveillance Division

Chicago Area Transportation Study
300 W. Adams
Chicago, Illinois 60606

April 1988
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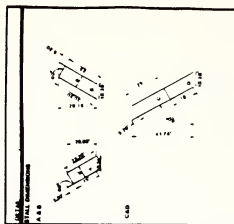
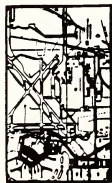
1.0 Introduction

Currently at O'Hare International Airport, limousines with prearranged passenger pickups are not allowed direct access to the lower level pickup areas at Terminals 1, 2 and 3. Instead, these vehicles must proceed through an access system located adjacent to the limousine staging area at O'Hare Parking Lot D. Figure 1 presents a diagram of the staging area and entrance to the access system.

Since the implementation of the access system, there have been complaints about the amount of time required to enter the system, travel to the terminal(s), locate and pickup prearranged passenger(s), and depart from the airport. Coupled with these complaints of excessive delays, operators have alleged that as a result of the amount of time it takes to circulate through the system, passengers are more likely to be hustled (the act of soliciting passengers against the established rules) from the curbside into waiting vehicles.

Responding to requests from several private operators, the Chicago Area Transportation Study (CATS) set out to measure several aspects of limousine operations. It should be noted that there are many facets to the smooth operation of ground transportation at the airport. While this report may address a few concerns, it may raise several other questions, some of which already have been answered in other studies that CATS has conducted at the airport. These studies are listed in Appendix A.

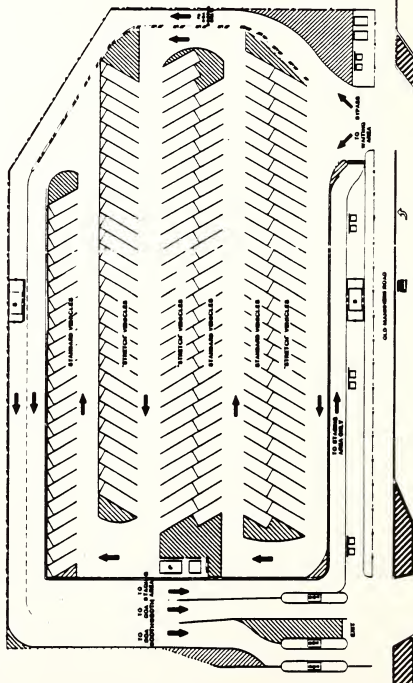
Figure 1



1. ALL VEHICLES MUST BE IN THE STADIUM AREA.
2. ALL VEHICLES MUST BE IN THE STADIUM AREA.
3. ALL VEHICLES MUST BE IN THE STADIUM AREA.
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PROPOSED PRE-ARRANGED RIDE
STADIUM AREA



2.0 Methodology

On Friday, March 18, 1988 CATS staff conducted a study of limousine dwell time at the airport. The study took place in both the limousine staging and the lower level pickup areas of terminals 1, 2 and 3. The hours of the study were from 3:00 PM until 10:00 PM. Limousines were timed throughout their stay in the staging area, during the trip to the terminals and while passengers were being picked up.

A total of five time checks were made. These checks were conducted by logging in the limousine's license plate number along with the time as it progressed through the system. This study was designed to identify travel times as opposed to the number of vehicles at each stage of the process. Therefore, a sample of vehicle license plate numbers and times were collected at several check points. At these check points a concerted effort was made to randomly sample vehicle license plates to assure the reliability of the data. The data collected and the collection points included:

1. A count was taken of all the limousines and suburban taxicabs entering the Lot D parking area as well as those limousines entering the access system queue directly. At the same time, the license plate number and time were recorded for the limousines. This information provided a basis from which to trace a limousine's progress as it passed each of the subsequent data collection points.
2. In order to measure the time that a limousine spent parked in Lot D, a sample of license plate numbers was drawn from the parked limousines just as they began to pull out of their parking spaces. This information was then compared with the time the limousine pulled into the parking area. To control for a potential locational bias, the sample was drawn to give equal representation to all rows in the lot.

3. The third data collection point was at the exit of Lot D. By comparing the data collected in steps 1 and 2 with license plate numbers and times collected at the exit it was possible to establish how long it took a limousine to either go through the access queue directly, or wait in the lot and then proceed to the queue.
4. The last data collection point was located to provide some information on how long it took a limousine operator to enter one of the chutes at the terminals, locate his/her passenger(s) and depart (loading time). To accomplish this, limousines were systematically sampled at each of three terminals (terminals 1, 2, and 3) by recording the vehicle's license plate number and the arrival and departure times in the chute. To provide for comparisons, a methodology consistent with the one used for the study documented in CATS Working Paper 86-11 was employed. Although the purpose of the counts taken at the chute locations was to obtain the vehicle dwell time in the chute, it was possible to compare the time that the vehicle entered the chute with the time the vehicle left the booth at Lot D to get an indication of the roadway travel times.

When reviewing the results of this effort as presented on the following pages, the median values are shown along with the arithmetic average (mean). The reason for using the median (50th percentile) was twofold. First, it was known that in the data in the sample tended to be skewed. Second, one could not always be sure of the reasons for the skewness of the data. That is, there were events that could not be explained by the time measurements. Given these conditions, the median was chosen as the best measure to use to analyze the data.

This concept can best be understood when one examines the travel times that were measured for vehicles leaving Lot D and arriving at the terminals. For example, limousines can pick up passengers at more than one terminal in a

single pass through the access system. Therefore, part of what was being measured was the limousines that went through the access system and had to make pick-ups at more than one terminal. Also, there were other events that could not be directly be attributed to roadway delay that were captured by the measurement technique. These are discussed in Section 4.0 of this report.

3.0 Results

Since the purpose of this study was to determine the typical travel times for limousines to access the airport on a Friday night, only the total figures are presented in this section. For those who wish to study the travel times in greater detail, hourly summaries are presented in Appendix B.

During the study period a total of 2,266 vehicles entered Lot D, of which 1,917, 85%, were limousines. The remaining 349 vehicles, 15%, were suburban taxis. The license plate numbers of 933 different limousines entering Lot D were recorded. These 933 vehicles accounted for 1,747 or 91% of the limousine trips to Lot D. The remaining 9% of the trips were made by limousines that were not identified by license plate number at time of entry to Lot D. (Trips made by unidentified vehicles are not included in the data that was analyzed.) Also, no attempts were made to identify individual taxis. Table 1 shows the summary of trips to Lot D by 15 minute and hourly intervals. As is shown by this table, the hours between 4:00 PM and 9:00 PM had the heaviest volume of entries into the staging process. The individual hours with the highest activity were from 5:00 PM to 6:00 PM and 7:00 PM to 8:00 PM. Each of these periods accounts for 17% of the trips made by limousines to Lot D.

When limousines enter Lot D they have a choice of entering the parking area or proceeding directly to the access queue which leads to the Department of Aviation (DOA) check-out booths. Table 2 summarizes the limousine trip frequency and compares the number of limousines entering the parking area with those entering the access queue. As is shown, limousines entering Lot D only once account for 45% of the vehicles, but only 24% of the total trips.

Table 1

Number of Vehicles Entering Parking Lot D
By 15 Minute and One Hour Intervals

<u>Time Interval</u>	<u>Limousines</u>	<u>Suburban Taxicabs</u>	<u>Total</u>
3:00 to 3:15	45	3	48
3:16 to 3:30	68	13	81
3:31 to 3:45	41	8	49
3:46 to 4:00	<u>44</u>	<u>17</u>	<u>61</u>
Hourly Total	198 (83%)	41 (17%)	239
4:01 to 4:15	87	7	94
4:16 to 4:30	71	19	90
4:31 to 4:45	66	22	88
4:46 to 5:00	<u>79</u>	<u>15</u>	<u>94</u>
Hourly Total	303 (83%)	63 (17%)	366
5:01 to 5:15	69	14	83
5:16 to 5:30	83	24	107
5:31 to 5:45	80	12	92
5:46 to 6:00	<u>87</u>	<u>7</u>	<u>94</u>
Hourly Total	319 (85%)	57 (15%)	376
6:01 to 6:15	78	5	83
6:16 to 6:30	61	5	66
6:31 to 6:45	77	19	96
6:46 to 7:00	<u>92</u>	<u>13</u>	<u>105</u>
Hourly Total	308 (88%)	42 (12%)	350
7:01 to 7:15	97	15	112
7:16 to 7:30	81	12	93
7:31 to 7:45	75	11	86
7:46 to 8:00	<u>71</u>	<u>13</u>	<u>84</u>
Hourly Total	324 (86%)	51 (14%)	375
8:01 to 8:15	56	13	69
8:16 to 8:30	72	8	80
8:31 to 8:45	82	10	92
8:46 to 9:00	<u>71</u>	<u>17</u>	<u>88</u>
Hourly Total	281 (85%)	48 (15%)	329
9:01 to 9:15	66	20	86
9:16 to 9:30	65	8	73
9:31 to 9:45	28	12	40
9:46 to 10:00	<u>25</u>	<u>7</u>	<u>32</u>
Hourly Total	184 (80%)	47 (20%)	231
TOTAL	1917 (85%)	349 (15%)	2266

Source: Counts taken by CATS staff at the entrance to Livery Lot D on Friday,
March 18, 1988.

Table 2

Summary of Limousines Entering the Parking
Area and Access Queue at Lot D
By the Frequency of Use

<u>N U M B E R O F</u>			<u>V E H I C L E A C T I V I T Y</u>	
<u>Times in</u> <u>System</u>	<u>Vehicles</u> <u>Nos. (Percent)</u>	<u>Trips</u> <u>Nos. (Percent)</u>	<u>Parking</u> <u>Area</u>	<u>Queued</u> <u>Directly</u>
1	422 (45.2%)	422 (24.2%)	59%	41%
2	300 (32.2%)	600 (34.3%)	61%	39%
3	140 (15.0%)	420 (24.0%)	60%	40%
4	54 (5.8%)	216 (12.4%)	61%	39%
5	14 (1.5%)	70 (4.0%)	71%	29%
6	2 (0.2%)	12 (0.7%)	50%	50%
7	<u>1 (0.1%)</u>	<u>7 (0.4%)</u>	100%	0%
TOTAL	933 (100.0%)	1747 (100.0%)	61%	39%

Source: Counts taken by CATS staff at the entrance to Livery Lot D between the hours of 3:00 P.M. and 10:00 P.M. on Friday, March 18, 1988.

Notes: Data represents a 91% sample of the limousine activity at Lot D during the study period.

The other 76% percent of the trips were made by 55% of the vehicles that used the system more than once. A graphic depiction of this information is presented in Figure 2.

By referring to Table 2 one can see that of the limousines that used the system once, 59% entered the parking area and 41% proceeded directly to the access queue. In fact, there is a greater tendency to use the parking area regardless of the number of times the vehicle accesses the system. It is interesting to note that the more frequent users of the system actually used the parking area more often than the infrequent users.

Summarizing the travel times presented in Figure 3, it takes 18 minutes (median) to pass through the access system, exit Lot D, travel to the terminal area, pick up a prearranged passenger and exit the terminal pickup area. However, if the limousine driver must wait for his/her passenger in the parking area, the median amount of time required to pass through the system increases to 27 minutes. A complete summary of the amount of time required to pass through each phase of the staging process is presented in Table 3 and Figure 3.

One last task was to compare the sampled license plate numbers collected at the terminals with those of the limousines that entered or exited the access system at Lot D. This comparison made it was possible to identify the limousines that presumably picked up passengers in the chutes without going through the system. Realizing that the first hour of non-matches were a

FIGURE 2

**SUMMARY OF REPEAT USAGE OF EITHER THE
PARKING AREA OR ACCESS QUEUE AT LOT D**

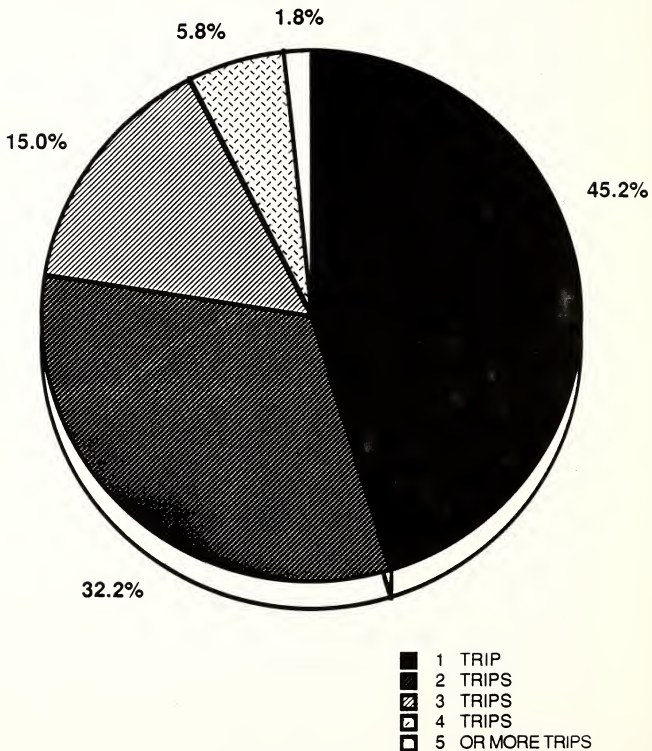


Figure 3

LIMOUSINE STAGING TIMES (MEDIAN TIME IN MINUTES)

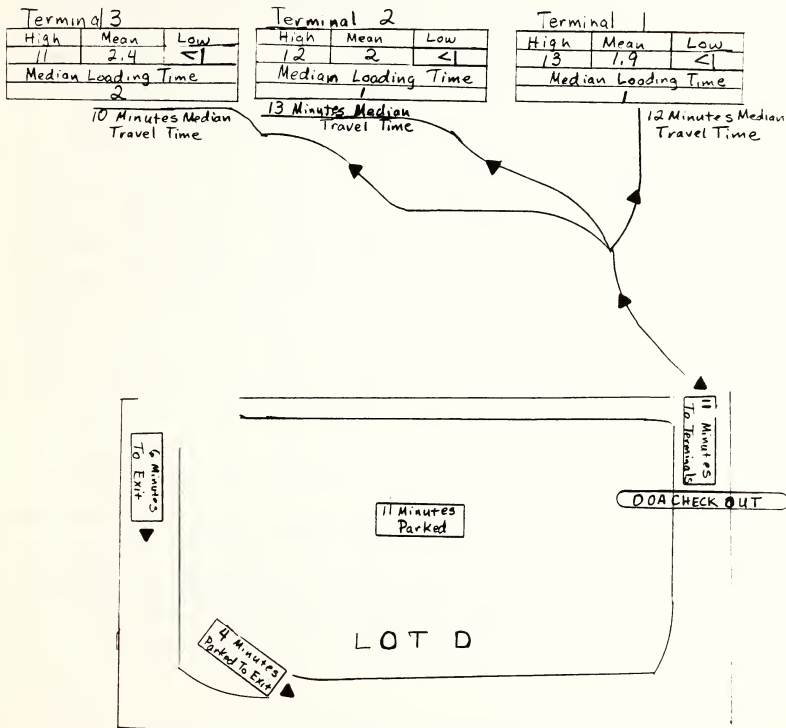


Table 3

Summary of Staging System Time Requirements

	N	Time in Minutes			
		High	Low	Mean	Median
Time Parked in Lot D	120	81	+1	18.5	11
Time from Lot D to Exit	107	27	1	6.4	4
Time from Queue to Exit	525	96*	+1	8.1	6
Time from Exit to Term. 1	218	80	3	15.6	12
Time from Exit to Term. 2	91	90	4	16.8	13
Time from Exit to Term. 3	140	63	3	14.1	10
Time from Exit to All Terms.	449	90	3	15.4	11
Loading Time at Term. 1	307	13	+1	1.9	1
Loading Time at Term. 2	125	12	+1	2.0	1
Loading Time at Term. 3	173	11	+1	2.4	2
Loading Time for All Terms.	605	13	+1	2.1	1

Source: Derived from data collected by CATS staff at O'Hare Airport between 3:00 PM and 10:00 PM on Friday, March 18, 1988.

Notes: * High Access Queue times can be attributed to two predominant factors. The vehicles either entered the queue and parked in the back row (along the fence) or they used the queue as a means to enter the parking area before exiting the lot.

'N' equals the number of observations in each of the cells.

result of the fact that these limousines were already in the system before the time check was taken, the observations made for the 3:00 PM hour were dropped from the data base for this part of the analysis. As can be seen by reviewing Table 4, 13% of the limousines that were identified in the chutes never used the access system at Lot D. When reviewing Table 4, keep in mind that 91% of the limousines license plates were sampled at the entrance to Lot D with a smaller sample being drawn at the exit and an even smaller sample at the terminals. Realizing this, one might conclude that the 13% non-match rate could be attributed to the limousines that were missed at each stage. However, given the fact that the terminal sample was compared back to both the entering and exiting samples the error rate is presumed to be 2% to 3%. It should be noted that this issue is raised more as a point for discussion that needs further investigation than as the definitive statement on the matter.

It should be noted that it was not possible to record every vehicle movement at every point in the staging process. Also, as outlined in the following observations section, some drivers did not proceed directly from one stage to the next. As a result, there are some time measurements which appear to be unusually long. For this reason, median as well as mean values are shown in order to provide a more realistic view of actual duration. Also, when calculating both the evening and hourly medians and means, standard statistical techniques were used. That is, when appropriate, weighting techniques were used to account for the varying limousine volumes.

Table 4

Number of Limousines Observed in the Chutes at the Terminals
that Never Went Through the Access System

<u>Time Period</u>	<u>Total Observed In Chutes</u>	<u>Not Observed At Lot D</u>	<u>Percent</u>
4:01 to 5:00 PM	67	9	13%
5:01 to 6:00 PM	108	18	17%
6:01 to 7:00 PM	145	28	19%
7:01 to 8:00 PM	83	5	6%
8:01 to 9:00 PM	79	10	13%
9:01 to 10:00 PM	<u>64</u>	<u>2</u>	<u>3%</u>
Total	546	70	13%

Source: Counts taken by CATS staff on Friday, March 18, 1988.

Notes: Due to a margin for sampling error, these figures may be slightly overstated. However, the matter may be worthy of future data collection efforts.

4.0 General Observations

Contained in this section are several observations that were made by the field crew members as they collected the information for this study. It should be pointed out that since these are observations they may contain a slight bias due to the observer's perception. However, they are presented for those who are interested in pursuing the study of operating issues at the airport in greater detail. The observations include:

1. At peak times several limousines went through the access system, had their work order processed, and then would either re-enter the Lot D parking area or park on the shoulder of Old Mannheim Road and wait before proceeding to the terminals.
2. There was a tendency for vehicles to park near the restrooms in the northeast corner of Lot D and in the access queue lane (in the back by the fence). Although the vehicles were not counted, observations showed that both taxi and limousine operators were guilty. It should be noted that at four times throughout the evening, DOA employees drove through and cleared these areas only to have them fill with idle vehicles immediately after the DOA employees left.
3. It appeared that the geometrics of Lot D are such that it is difficult to maneuver stretch vehicles. One accident was observed just inside the entrance of the Lot D parking area.
4. There are a variety of conflicting traffic movements that occur at the entrance to Lot D. There are vehicles entering from both the north and the south which, directly upon entering, must decide to go through the queue or into the parking area. Complicating this situation, there were 32 vehicles that exited through the entrance and 6 private passenger cars that inadvertently pulled into the entrance.
5. Several times during the evening northbound traffic on Old Mannheim Road backed up past the Lot D entrance adding to delays entering the lot.
6. When the queue in the lot is full (i.e. the by-pass lane), there is a tendency for vehicles to enter the main lot and cut into the queue at the point where the by-pass lane and the parking area lanes merge.

7. Several vehicles used Lot D to park without going through the access system. One of these individuals was observed in the Lot D parking area for 60 minutes.
8. A CATS staff person was solicited for a ride inside one of the terminals by a person claiming to represent one of the limousine services.
9. Also, CATS staff working the chute area at the terminals observed several drivers of limousines pick up passengers before entering the chutes and at other locations outside the designated chutes.
10. While at the airport, the question was raised concerning large "limousine" type vehicles with passenger license plates loading in the limousine chutes at the terminal. These vehicles were not addressed by the study.
11. It was observed that at times the DOA booths at the terminals were not manned. Additionally, there were times when the volume of limousines was so great that the starters could not keep up with the collection of the work orders.

Appendix A

Reports CATS Has Completed Relating
To
Ground Transportatiopn at O'Hare International Airport

"Limousine Vehicular Delay Study--O'Hare International Airport", CATS Working Paper 86-11, June 1986.

"An Inventory of Vehicles Traversing the Lower Roadway at O'Hare International Airport", CATS Working Paper 85-12, June 1986.

"A Survey of Commercial Vehicle Access Controls at Major U.S. Airports", CATS Working Paper 84-14, September 1985.

"Analysis of Taxis and Limousines Departing From O'Hare Airport", CATS Working Paper 84-10, June 1984.

Appendix B

Time Parked in Lot D

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Time Period	N	Time in Minutes			
		High	Low	Mean	Median
3:00 PM to 4:00 PM	26	81	1	16.0	7
4:01 PM to 5:00 PM	39	69	1	16.3	10
5:01 PM to 6:00 PM	14	35	1	11.6	8
6:01 PM to 7:00 PM	7	72	1	29.3	20
7:01 PM to 8:00 PM	18	63	2	16.9	11
8:01 PM to 9:00 PM	8	57	3	35.0	40
9:01 PM to 10:00 PM	8	47	2	27.3	34

Time It Took to Get from the Parking Area to the Lot D Exit

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Time Period	N	Time in Minutes			
		High	Low	Mean	Median
3:00 PM to 4:00 PM	30	27	2	7.0	7
4:01 PM to 5:00 PM	34	7	1	3.1	3
5:01 PM to 6:00 PM	13	20	5	9.2	8
6:01 PM to 7:00 PM	0	-	-	-	-
7:01 PM to 8:00 PM	15	22	3	12.5	14
8:01 PM to 9:00 PM	1	6	6	6.0	6
9:01 PM to 10:00 PM	14	19	1	4.3	3

Source: Counts taken by CATS staff at the entrance to Livery Lot D on Friday, March 18, 1988.

Notes: 'N' equals the number of observations.

Appendix B Continued

Time From Access Queue to Lot D Exit

Time Period	N	Time in Minutes			
		High*	Low	Mean	Median
3:00 PM to 4:00 PM	62	52	1	10.4	9
4:01 PM to 5:00 PM	94	39	1	5.1	3
5:01 PM to 6:00 PM	101	65	1	8.0	8
6:01 PM to 7:00 PM	81	96	2	12.6	10
7:01 PM to 8:00 PM	87	38	1	6.2	5
8:01 PM to 9:00 PM	62	68	1	8.6	8
9:01 PM to 10:00 PM	38	42	1	5.7	4

Time to Travel from From Lot D Exit to the Terminals

Time Period	N	Time in Minutes			
		High	Low	Mean	Median
3:00 PM to 4:00 PM	46	39	4	14.1	12
4:01 PM to 5:00 PM	59	90	3	15.5	10
5:01 PM to 6:00 PM	78	71	4	16.1	13
6:01 PM to 7:00 PM	78	80	4	16.3	13
7:01 PM to 8:00 PM	74	63	4	17.6	14
8:01 PM to 9:00 PM	72	67	3	15.3	11
9:01 PM to 10:00 PM	42	53	3	10.0	8

Source: Counts taken by CATS staff at the entrance to Livery Lot D on Friday, March 18, 1988.

Notes: * High Access Queue times can be attributed to two predominant factors. The vehicles either entered the queue and parked in the back row (along the fence) or they used the queue as a means to enter the parking area.

'N' equals the number of observations.

Appendix B Continued

Loading Time at the Terminals

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Time Period	N	Time in Minutes			
		High	Low	Mean	Median
3:00 PM to 4:00 PM	59	8	<1	1.7	1
4:01 PM to 5:00 PM	67	7	<1	1.8	1
5:01 PM to 6:00 PM	108	12	<1	2.1	1
6:01 PM to 7:00 PM	145	10	<1	1.3	1
7:01 PM to 8:00 PM	83	13	<1	2.4	1
8:01 PM to 9:00 PM	79	11	<1	2.7	2
9:01 PM to 10:00 PM	64	11	<1	3.0	2

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Source: Counts taken by CATS staff at the entrance to Livery Lot D on Friday, March 18, 1988.

Notes: 'N' equals the number of observations.

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